

## **APPENDIX E**

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### Best Management Practices and Hydrology

## **BEST MANAGEMENT PRACTICES AND ENVIRONMENTAL BENEFITS**

### ***INTRODUCTION***

The Best Management Practices (BMPs) proposed for the proposed project are intended to control and treat the runoff from the proposed site in accordance with the California Regional Water Quality Control Board, Lahontan Region (Lahontan), the Tahoe Regional Planning Agency (TRPA), and Placer County. Construction BMPs will be necessary to control runoff and sedimentation per the National Pollutant Discharge Elimination System (NPDES). Discharge from the proposed development from roadway runoff, and from other impervious surfaces will be addressed by implementation of BMPs. Discharge from the development may include waste materials from maintenance work, nutrients, petroleum products, contaminated storm water runoff, and sediment attributed to general water and wind erosion.

The Tahoe Regional Planning Agency sets forth discharge standards outlined within Chapter 81, Water Quality Control, of the TRPA Code of Ordinances.

### ***EXISTING SITE CONDITIONS***

The existing 12.5-acre site as shown in the location map, Figure 1, is currently undeveloped and is heavily forested with minor open areas. There is no evidence of erosion, channelization, or of historical drainageways through the site. The slopes range from three to fifteen percent, and the vegetation is semi-dense to dense with stands of conifers and cedar, with an understory of mountain type shrubs. The soils are moderately permeable.

There are currently no BMPs installed on site, and runoff is primarily through overland flow. Any development on the site will require containment of the runoff generated from the impervious surfaces on the parcel during a 20-year, one-hour storm, approximately one inch of rain, with discharge after treatment meeting acceptable levels of constituents per the regulatory agencies.

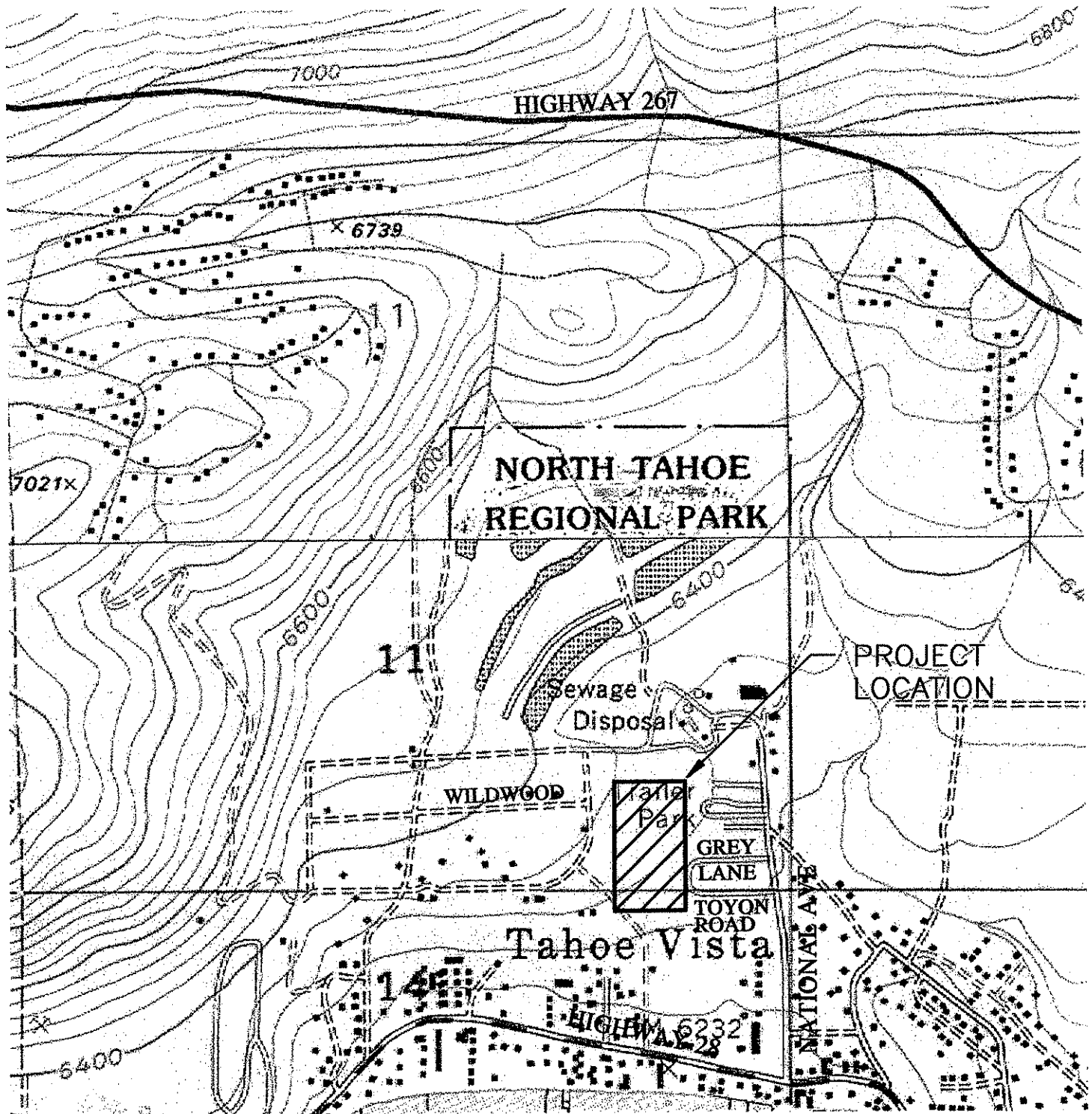
### ***PROPOSED IMPROVEMENTS AND PERMANENT BMPs***

#### ***Roadway and Access Treatment System Design***

Improvements will be designed for treatment of the runoff generated by the 20-year, one-hour storm event as required by Lahontan and the TRPA. The volume of runoff is calculated based upon one inch of precipitation over the entire impervious surface area found on the site. According to the design guidelines provided by these agencies, treatment facilities must treat this runoff for removal of petroleum-based products and the volume of runoff also needs to be stored onsite and allowed to evaporate or infiltrate.



SCALE: 1"=1000'



C0310-FIG-1.DWG PLOT = AUG 27, 2004 SAVED AUG 26, 2004



CEDAR GROVE APARTMENTS  
AFFORDABLE HOUSING PROJECT-EIS/EIR  
LOCATION MAP

FIGURE  
1

Figure 2 shows the proposed BMPs. There are 15 points of discharge spaced along the roadside to provide space for infiltration of the water collected from the roadway. In addition, four other points of interest were identified to provide for additional infiltration. The road is sloped to one side in order to direct the runoff into a paved swale and along curb and gutter. Inlets are spaced evenly at various points to collect, at a minimum, the 20-year, one-hour storm runoff event. Treatment systems may be designed to occur within these points in order to capture sediment. The catch basins will need to be designed appropriately to settle out the required amount of sediment and sediment grain size in accordance with the TRPA and Lahontan standards, prior to infiltration. An insert in the catch basins will also need to remove the required amounts of oil and grease if required for these small areas at these inlet points. Once treated, the runoff volume from the 20-year, 1-hour storm must be infiltrated.

POI - 1 and 14, see Figure 2, are the downstream treatment basins that will also serve as part of the detention basin systems for attenuating post-development increases in flow prior to offsite discharge. Flows from storm events greater than the capacity of the inlets or basin designs shall either bypass or be conveyed through the site to these facilities. The Placer County SWWM requires that conveyance facilities be designed for the 10-year storm frequency, and that the 100-year storm be conveyed through the site. The intention of this project is to route only the 20-year storm into the treatment devices, allowing the larger events to bypass the inlets and be conveyed along the roadway and swale, to the project boundaries. If the inlets capture more than the designed volume, the infiltration devices or basins shall be designed with an overflow or bypass. At these points, overflows will be directed to the detention facilities and discharged at the pre-development rate. The flows will be dispersed by overland flow. If other agreements are made, the project may discharge to either regional facilities or community facilities adjacent to the project site; however, the capacities of these facilities would need to be evaluated.



CEDAR GROVE APARTMENTS  
AFFORDABLE HOUSING PROJECT-EIS/EIR  
PROPOSED IMPROVEMENTS

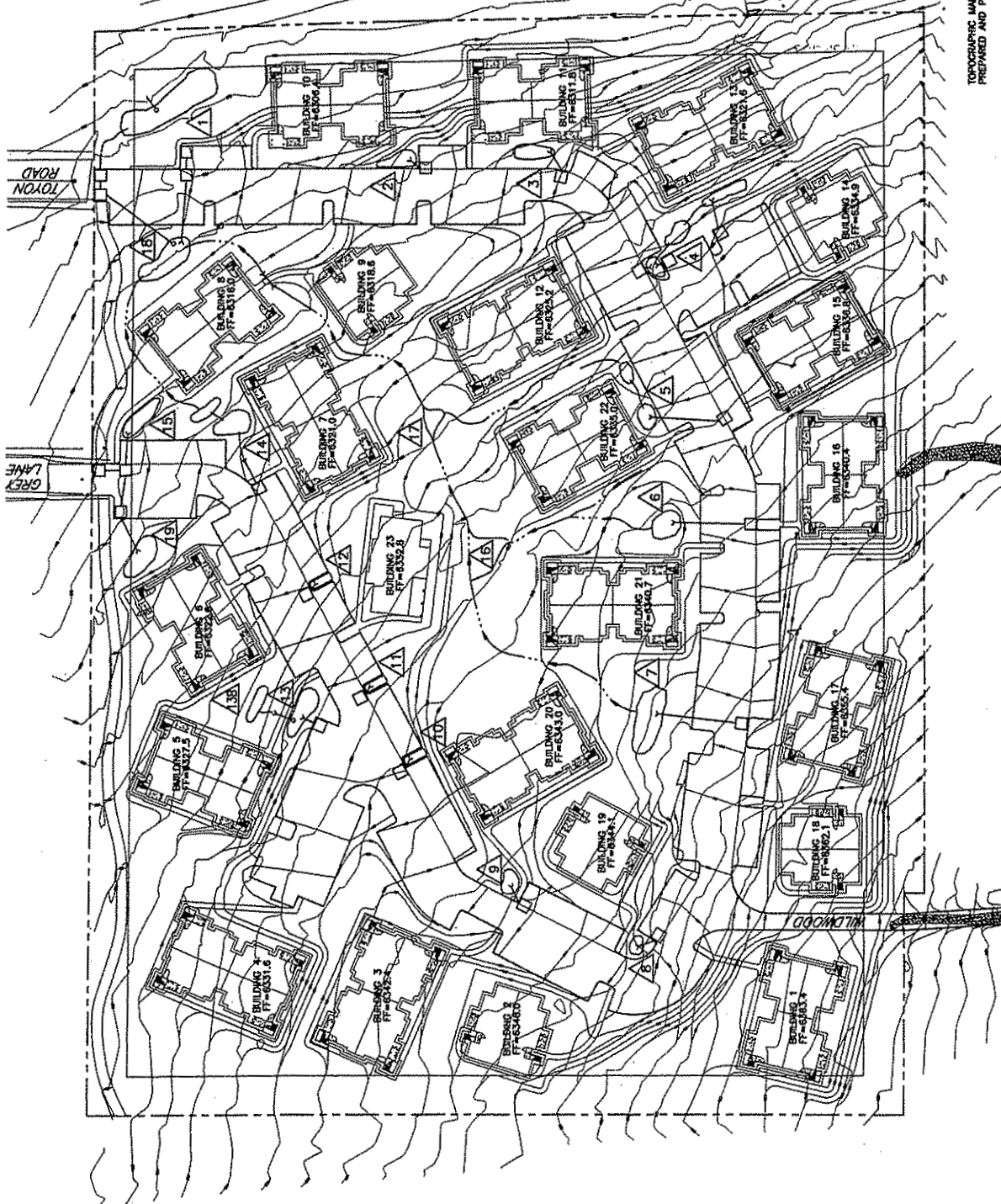
FIGURE  
2



0 50 100

APN 112-050-001  
MUNICIPALITY OF  
TAHOE VISTA, CALIFORNIA  
LAND CAPABILITY - 4

- POINT OF INTEREST
- INLETS
- SWALES
- PIPING



TOPOGRAPHIC MAPPING AND SITE PLAN  
PREPARED AND PROVIDED BY K.B. FOSTER, CIVIL ENGINEERING, INC.

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Table 1 below outlines the impervious surface area for the two areas associated for which flow will or could be directed to the treatment basins. See Figure 3 for the proposed impervious areas. If it is decided during design of the project to use the treatment vaults or infiltration galleries for storage of runoff, a column in the table has been provide for volume in gallons.

**Table 1**  
**Required Runoff Volumes Associated with Treatment Basins**

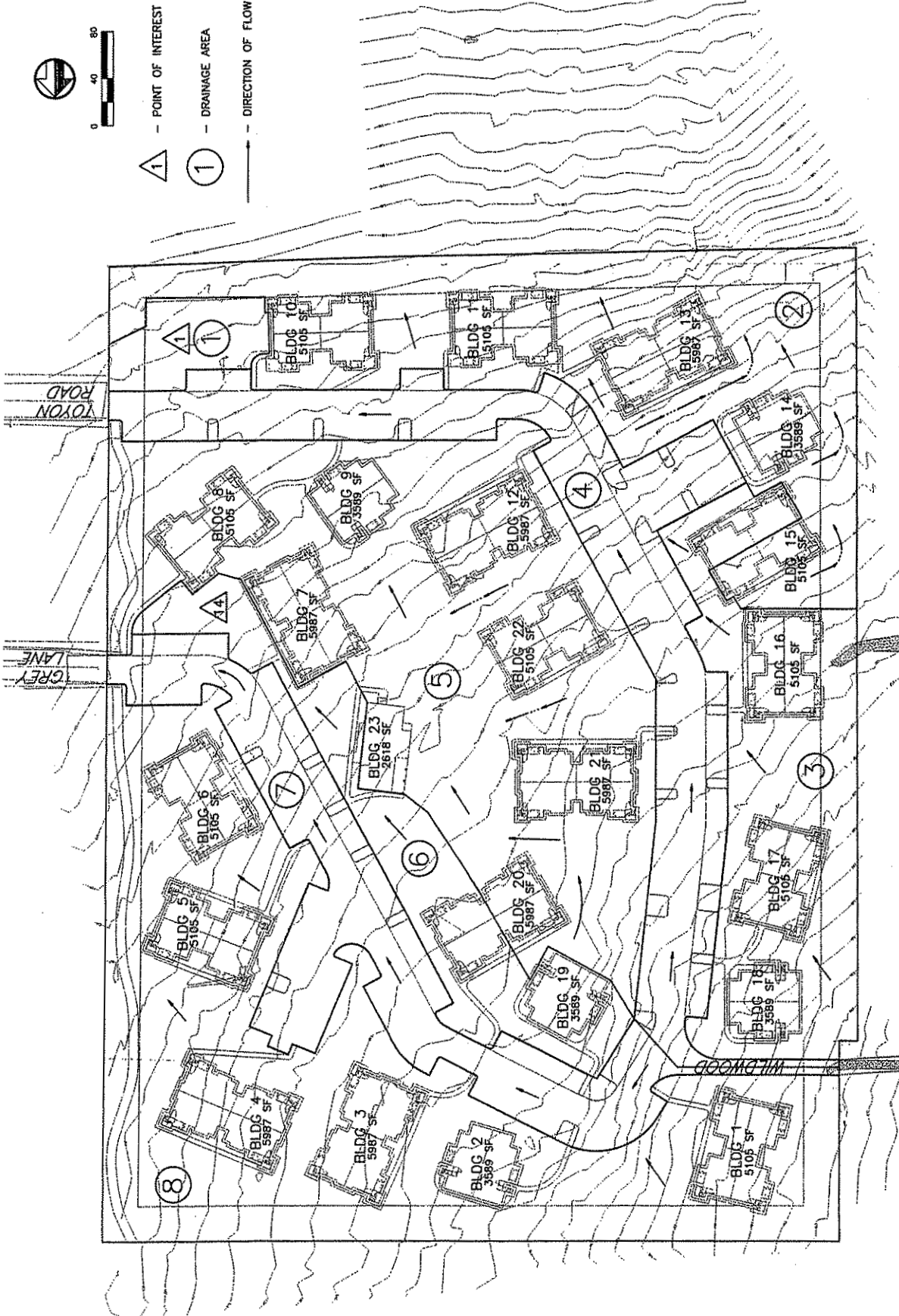
<b>Area Description</b>	<b>Impervious Area (ft<sup>2</sup>)</b>	<b>Treatment Volume (ft<sup>3</sup>)</b>	<b>Treatment Volume (gallons)</b>
Upper Access Road & Parking Areas for Drainage Area 7	45,185	3,765	28,162
Lower Access Road & Parking Areas for Drainage Area 4	57,279	4,773	35,702
<b>Total</b>	<b>102,464</b>	<b>8,538</b>	<b>63,864</b>

*Note: See Figure 3 for Drainage Areas*



CEDAR GROVE APARTMENTS  
AFFORDABLE HOUSING PROJECT-EIS/EIR  
PROPOSED DRAINAGE AREAS

FIGURE 3



Infiltration basin design shall consider that Placer County requires ponds with retained depths greater than two feet be fenced for safety purposes. Table 2 below provides an example of the volumes of storage in each of the ponds, based upon the design of two infiltration basins at POI - 1 and 14, as shown in Figure 2. A total volume requirement for infiltration basins is included. If a series of basins are designed the total volume must be treated and then infiltrated, and may be divided between all of the basins and appropriately sized for each tributary area. The runoff may be treated within a sand-oil interceptor or water quality treatment device and then infiltrated through a series of infiltration galleries.

**Table 2**  
**Treatment Basin Storage Areas**  
**Preliminary Calculations**

	Area Required for Storage Volume (SF)		
	1 ft Depth	1.5 ft Depth	2.0 ft Depth
Upper Basin - POI 14	3,765	2,510	1,883
Lower Basin - POI 1	4,773	3,182	2,387
Total (One Basin)	8,538	5,692	4,270

*Note: Points of Interest are found in Figure 2.*

The treatment volume totals must be met for each drainage area utilizing Table 1, or by utilizing Table 2, the basin areas must be met either by designing a series of basins downstream of the area to treat or by designing either two terminal treatment basins meeting the total areas shown for two basins or one downstream basin with a combined total area.

If the Points of Interest 1 and 14, are used for detention facilities, then storage of a volume of water in addition to the treatment volume must be added to the designed capacity of each pond. The sizing of the detention facilities is discussed in Section 3 of the Preliminary Drainage Study for the proposed project.

### ***Roof Runoff***

Roof runoff is addressed by implementing direct infiltration via infiltration trenches, drywells or infiltration galleries. Roof runoff is considered "clean" water and no further water quality treatment is required. Table 3 depicts the typical roof runoff volumes associated with the three proposed building sizes. The permeability rate of the soils is one inch per hour, recommended by TRPA for the JwD and JwE soil types. If site conditions vary from that assumed from the soils survey, or if field investigations prove that the permeability varies from that used in this analysis, the following table should be revised.



**Table 3  
Roof Runoff Treatment**

Roof Size (sf)	Volume Runoff (cf)	Typical 32"W x 24"D Trench Length (ft)
3,589	299	150
5,105	425	220
5,987	499	250

The table above was developed using a TRPA spreadsheet used to size typical infiltration systems and assuming a trench backfilled with drain rock. A copy of the spreadsheet is included in the Appendix. Dripline trenches may be used or other systems utilizing gutters and downspouts may be designed. In either case, the volume of runoff shown in the Table 3, generated by the roofs must be directed to infiltration devices.

#### ***Walkways and Bike Path***

The quantity of runoff generated by pedestrian walkways and bike paths are relatively low. Therefore, small infiltration trenches or landscape areas immediately adjacent of the paths will be suitable for treating the runoff.

#### ***CONSTRUCTION BMPs***

The developer of the Cedar Grove Apartments upon commencement of construction of the proposed site improvements, will need to install temporary construction BMPs on and off site. To ensure that these activities will minimize their impact to the surrounding area and meet the various agencies' requirements, the following temporary construction BMPs may be required to be implemented at various times throughout the duration of the overall development of the plan.

1. Site disturbance such as clearing and grubbing, grading, cut/fill etc. is limited to the period of time between May 1 and October 15 without special authorization from the appropriate agencies.
2. Equipment used during construction shall have proper mufflers to reduce the noise levels and shall not exceed the allowable levels between 6:00 P.M. and 8:00 A.M.
3. Temporary erosion control facilities shall be installed to prevent the transport of earthen materials and other waste off the property.
4. Temporary gravel earthen berms, sand bag dikes or filter fence shall be used as necessary to prevent discharge of earthen materials from the site during periods of precipitation or runoff. These facilities shall be inspected regularly to insure that they continue to function properly.

5. Tree protection fencing shall be installed around trees which are intended to remain in place throughout construction of the project.
6. A minimum of 48 hours notice shall be provided to the appropriate agencies so that a pre-grading inspection can be conducted at the site to ensure proper installation of the temporary erosion control measures.
7. Ground compaction and disturbance activities shall be minimized in unpaved areas not subject to construction. The non-construction areas shall be protected with fencing or other barriers to limit access.
8. Prior to October 15 of each year all disturbed or eroding areas shall be stabilized by commencing with permanent, or temporary if the project is incomplete, vegetative or mechanical stabilization measures as outlined by the plans.
9. All slopes subject to erosion shall be stabilized.
10. All loose piles of soil, silt, clay, sand, debris, or other earthen material shall be protected in a reasonable manner to prevent the discharge of these materials caused by runoff.
11. If groundwater is encountered during construction and the excavated area requires dewatering in order to complete the work, a separate NPDES Permit may be required. Dewatering shall be done in a manner that treats the water and allows it to infiltrate back into the groundwater or reduce the levels of constituent to a level acceptable for discharge into surface waters.
12. Dust shall be controlled to prevent transport of such materials off the project sit, into any surface water, or into any drainage course.
13. The discharger shall immediately clean up and transport to a legal disposal site any spilled petroleum products or petroleum-contaminated soils to the maximum extent possible.
14. At or before completion of the construction project or at the end of the grading season, all surplus or waste earthen materials shall be removed from the project site and disposed of only at a legal, authorized point of disposal or stabilized onsite in accordance with previously approved erosion control plans.
15. Drainage swales disturbed by construction activities shall be stabilized by appropriate soil stabilization measures to prevent erosion.
16. All areas compacted by construction activities and not intended to become permanent land coverage shall be ripped and revegetated with native vegetation to create a pervious surface.

## **APPENDIX**

**Infiltration and Storage System Sizing and Capability**  
(use the chart and equation below)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	TOTAL
surface width (ft)															--
surface length (ft)															--
surface area (sq. ft.)	3589	5105	5987												14681
volume of runoff (cu. ft.)	299.0	425.0	499.0												1223.4
BMP width (in.)	32	32	32												--
BMP depth (in.)	24	24	24												--
BMP length (ft.)	150	220	250												--
BMP % void	33%	33%	33%												--
soil permeability (in. / hr)	1	1	1												--
BMP capability (cu. ft.)	314.0	460.5	523.3												1297.9
system installed level (y/n)	y	y	y												--
* BMP sized correctly?	YES	YES	YES												--

$$\begin{aligned}
 \text{capability (cubic feet)} &= \left( \frac{\text{width}''}{12} \times \text{length}' \times \frac{\text{permeability}''/\text{hr}}{12} \right) \\
 &+ \left( \frac{2}{3} \times \frac{\text{depth}''}{12} \times \text{length}' \times \frac{\text{permeability}''/\text{hr}}{12} \right) \\
 &+ \left( \frac{\% \text{void}}{100} \times \frac{\text{width}''}{12} \times \text{length}' \times \frac{\text{depth}''}{12} \right)
 \end{aligned}$$

\* The capability must be greater than or equal to the volume of runoff from the hard surface.

\* All infiltration and storage systems must be installed level.